UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,113	07/18/2003	Olli-Pekka Pohjola	088245-2346	1632

23524 7590 07/21/2010
FOLEY & LARDNER LLP
150 EAST GILMAN STREET
P.O. BOX 1497
MADISON, WI 53701-1497

EXAMINER	
LIU, LI	
ART UNIT	**PAPER NUMBER**
2613	
MAIL DATE	**DELIVERY MODE**
07/21/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/622,113	POHJOLA ET AL.	
	Examiner	Art Unit	
	LI LIU	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _19 April 2010_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1,4,8-13,15,16,20,21,23,33,34 and 43-59_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,4,8-13,15,16,20,21,23,33,34 and 45-59_ is/are rejected.

7)☒ Claim(s) _43 and 44_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _03 November 2006_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 4/19/2010 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 4, 8-10, 13, 15, 33, 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al (US 5,706,111) in view of Okano et al (US 6,449,074) and Kim et al (Kim et al: “A Low-Cost WDM Source with ASE Injected Fabry-Perot Semiconductor Laser”, IEEE Photonics Technology Letters, Vol. 12, No. 8, August 2000, page 1067-1069) and Stubkjaer (Stubkjaer: “Semiconductor Optical Amplifier-Based All-Optical Gates for High-Speed Optical Processing”, IEEE Journal on Selected Topics in Quantum Electronics, Vol. 6, No. 6, November/December 2000, pages 1428-1435).

1). With regard to claim 1, Morales et al discloses an optical data transmission system (e.g., Figures 2 and 3), comprising:

a hub (e.g., the switch center CE in Figure 2);

a kerb location (the access node AN in Figure 2) having an optical router (the multiplexer and the optical access board OAB in the AN: column 4, line 27, and column 5 line 22-23; refer Figure O1 above, the multiplexer, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths and routes the multiplexed $\Sigma\lambda_i$ over one of the optical fibers to the CE) and a plurality of optically pumped sources (e.g., the OAB in Figure 2; Morales et al discloses that “the conversion to electrical signals takes place only in the network terminating equipment to which the subscriber terminals are connected”, column 3, line 63-65; and “consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that occur in present networks”, column 1, line 16-20; that is, a plurality of optically pumped sources are presented in the AN); and

a plurality of optical network units (e.g., the optical network terminals ONT in Figure 2) each corresponding to an optically pumped source (e.g., OAB in Figure 2), wherein each optical network unit has a laser for producing data modulated pumping light for transmission to its respective optically pumped source (the laser in each ONT generates data modulated pumping light, e.g., λ_a, or λ_d or λ_e in Figure 2, to the OAB);

wherein the plurality of optically pumped sources is configured to form data modulated transmission light at a predefined wavelength range (e.g., Figure 2, the wavelength λi) assigned to its respective optical network unit (Figure 2, column 5 line 18-22, the OABs performs the conversion of the fixed wavelength coming from each

subscriber optical network terminating unit into another wavelength λi that is different for each active unit, into a set of m different wavelengths);

wherein the optical router comprises a wavelength division multiplexer (WDM) configured to receive the data modulated transmission light from the plurality of optically pumped sources (e.g., Figure 2 or Figure O1 above, the wavelength division multiplexer (WDM), which is located between the OABs and the optical fiber OF, receives the data modulated transmission light λi from the plurality of optically pumped sources OABs; column 4 line 27-28 and column 5 line 17-32), and

route the data modulated transmission light to the hub (Figure 2 or Figure O1 above, the multiplexer, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths, and route the multiplexed signal $\Sigma\lambda_i$ over one of the optical fibers to the CE or hub).

But, Morales et al does not expressly state that the kerb location is a passive kerb location; and each optical network unit corresponds to only one of the plurality of optically pumped sources; wherein each optically pumped source is configured to receive injection light from an injection source outside the passive kerb location and to receive the data modulated pumping light from its respective optical network unit, wherein the data modulated transmission light is based on the injection light and the data modulated pumping light, wherein each predefined wavelength range corresponds to a distinct wavelength channel.

Regarding each ONU corresponding to only one optically pumped source, first, Morales teaches that each ONU (or ONT) sends three wavelengths (e.g., λ_a, or λ_d or λ_e)

to the access node (or kerb location), then to three optically pumped sources (e.g., OAB: λ_a<->λ_1, or λ_d<->λ_1, or λ_e<->λ_1); that is, while three wavelengths are used, each ONT corresponds to three optically pumped sources. However, as disclosed by Morales et al, the three wavelengths corresponds to three different services: a first wavelength λ_a is used for ATM services, a second wavelength λ_d for television distribution services and a third wavelength λ_e for an ether service (transparent optical channel, equivalent to a conventional leased line). It is obvious to one skilled in the art that when only one service is needed (then only one wavelength is needed), the ONU (or ONT) is corresponding to only one optically pumped source; and "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled" (531 F.2d at 1053, 189 USPQ at 148.), same is true: mere scaling down of a prior art process capable of being scaled down, if such were the case, would not establish patentability in a claim to an old process so scaled. And omission of an element and its function is obvious if the function of the element is not desired (Ex parte Wu, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989)), while only ATM service is needed, the other two optically pumped sources (e.g., λ_d<->λ_1, or λ_e<->λ_1) can be omitted, and then the ONU (or ONT) corresponds only one optically pumped source.

Second, another prior art, Okano et al, teaches an optical transmission system in which each optical sender (Figure 1: 8 (#1 to #n)) corresponds to only one of the plurality of wavelength converters (12 #1 to #n). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the

teaching of Okano et al to the system of Morales et al so that the system of Morales also can be used for single service, and the optical network unit is then corresponding to one optically pump source.

Regarding the passive kerb location and the injection source, however, Kim et al teaches a plurality of injection-locked sources (e.g., F-P SLD in Figures 1 and 5) configured to receive injection light from an injection source (the Broad-band ASE source in Figures 1 and 5) outside the passive kerb location and to receive the data modulated pumping signal (e.g., the PRBS in Figure 1) from its respective optical network unit, wherein the injection-locked source is configured to form data modulated transmission light (the light sent from F-P SLD to the AWG) at a predefined wavelength range assigned to its respective optical network unit (Figure 5, each ONU assigned a specific wavelength predefined by the ASE source and the AWG) wherein the data modulated transmission light is based on the injection light and the data modulated signal (Figures 1, 2 and 5, the data modulated transmission light is based on the injection light due to the injection locking, and the data is modulated on the transmission light), and wherein each predefined wavelength range corresponds to a distinct wavelength channel (the AWG slices the broad band ASE source and routes the individual wavelength to respective F-P SLD).

But, Kim et al does not expressly state that the data signal used to pump the F-P SLD is an optical signal, or the F-P SLD is "optically pumped source".

However, to use an optical data signal to pump an injection locking source is well known in the art. Stubkjaer teaches an optical wavelength converter (e.g., Figure 1a) in

which a data signal $\lambda 1$ pumps the optically pumped source (Optical gate, the injection light is CW light $\lambda 2$). Stubkjaer discloses that the opto-electronic conversion is avoided (page 1428, left column).

Morales et al teaches that the wavelength converter or optically pumped source can be placed at the kerb location (e.g., AN in Figure 2). The combination of Kim at al and Stubkjaer teaches an optically pumped injection-locked light source. And Kim et al and Stubkjaer teach a cost-effective and highly reliable and flexible optical WDM system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the injection-locked light source as taught by Kim et al and Stubkjaer to the access node (or kerb location) of Morales et al and Okano et al so that a passive kerb location can be obtained and a cost-effective and highly reliable and flexible WDM network can be realized.

2). With regard to claim 4, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. And Morales et al further discloses wherein the data modulated pumping light is within a wavelength range which does not include the wavelength or wavelengths of the wavelength channels (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength channels are λ_1, λ_2 , … λ_m , Figure 2 of Morales, and column 7 line 14-16, the λ_1, λ_2 , … λ_m are new wavelengths).

3). With regard to claim 8, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. And Morales et al further discloses wherein respective ones of the optical network units are sufficiently

similar so that they are interchangeable (column 3, line 13-18, and column 4 line 59-67, the ONTs are identical to each other).

4). With regard to claim 9, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. And Morales et al and Kim et al and Stubkjaer further discloses wherein the optically pumped sources are injection locked lasers (the F-P SLD as in Figures 1 and 5 of Kim) configured to receive injection light (the light from the Broad-band ASE source in Figures 1 and 5), and wherein the injection source of the injection light is upstream from the passive kerb location (e.g., the injection light is from the center office, Figure 5).

5). With regard to claim 10, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. And Morales et al and Kim et al and Stubkjaer further discloses wherein an injection wavelength is selected by at least one of a wavelength division multiplexer or an arrayed waveguide grating (e.g., the AWG in Figure 1 and 5 of Kim et al select the injection wavelength).

6). With regard to claim 13, Morales et al and Okano et al and Kim et al and Stubkjaer to disclose all of the subject matter as applied to claim 1 above. And Morales et al further discloses wherein the data modulated pumping light is at a wavelength different from the wavelength of light used to carry data traffic upstream from the kerb location and downstream from the hub (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength used to carry data traffic in upstream and downstream directions are λ_1, λ_2 , … λ_m , Figure 2 of Morales, and column 7 line 14-16, the λ_1, λ_2 , … λ_m are new wavelengths).

7). With regard to claim 15, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. And Morales et al and Kim et al and Stubkjaer further discloses wherein the optical router comprises an arrayed wavelength grating (e.g., the AWG in Figure 1 and 5 of Kim et al can be the optical router).

8). With regard to claim 33, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claims 1 and 9 above. And Morales et al and Kim et al and Stubkjaer further discloses wherein the injection light is amplified spontaneous emission noise produced by an upstream preamplifier (e.g., the broad-band ASE source of Kim et al).

9). With regard to claim 53, Morales et al discloses a method of optically transmitting data (e.g., Figures 2 and 3), the method comprising:

receiving data modulated pumping light from a plurality of optical network units at a kerb location in an optical data transmission system (e.g., Figure 2, the kerb location AN receives data modulated pumping light λ_a or λ_d or λ_e from a plurality of optical network units ONTs) wherein the kerb location comprises a wavelength division multiplexer (WDM) (e.g., Figure 2 or Figure O1 above, the wavelength division multiplexer (WDM), which is located between the OABs and the optical fiber OF, receives the data modulated transmission light λi from the plurality of optically pumped sources OABs; column 4 line 27-28 and column 5 line 17-32) and a plurality of optically pumped sources (e.g., the OAB in Figure 2; Morales et al discloses that "the conversion to electrical signals takes place only in the network terminating equipment to which the

subscriber terminals are connected", column 3, line 63-65; and "consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that occur in present networks", column 1, line 16-20; that is, a plurality of optically pumped sources are presented in the AN) each assigned to a respective optical network unit (Figure 2, each OAB is assigned to a respective optical network unit ONT), and wherein the optically pumped sources are configured to form data modulated transmission light based on the data modulated pumping light (column 5 line 17-21, the OAB converts the fixed wavelength, λa or λd or λe, into another wavelength λi, and the data that is originally carried on the data modulated pumping light λa/λd/λe is now carried on the data modulated transmission light λi; that is, the data modulated transmission light λi is formed based on the data modulated pumping light λa/λd/λe);

converting the data modulated pumping light from each optical network unit into data modulated transmission light (the OAB converts the data modulated pumping light λa or λd or λe from each ONT unit into data modulated transmission light λi), wherein each optical network unit is assigned a distinct predefined wavelength range (e.g., Figure 2, the wavelength λi) for its data modulated transmission light corresponding to a distinct wavelength channel (column 5 line 18-22, the wavelength λi that is different for each active unit, and each wavelength channel λi has a specific bandwidth; that is, each predefined wavelength range corresponds to a distinct wavelength channel);

receiving the data modulated transmission light at the WDM from the plurality of optically pumped sources (e.g., Figure 2 or Figure O1 above, the wavelength division multiplexer (WDM), which is located between the OABs and the optical fiber OF, receives the data modulated transmission light λi from the plurality of optically pumped sources OABs; column 4 line 27-28 and column 5 line 17-32); and

routing, using the WDM, the data modulated transmission light for transmission to a hub based on the respective distinct wavelength channels (Figure 2 or Figure O1 above, the multiplexer, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths and route the multiplexed signal $\Sigma\lambda_i$ over one of the optical fibers to the CE or hub).

Morales et al teaches the optically pumped source. But, Morales does not expressly disclose: wherein a first optically pumped source is configured to receive the data modulated pumping light at a wavelength different from other wavelengths of data modulated pumping light received at the other optically pumped sources; and passively converting the data modulated pumping light from each optical network unit into data modulated transmission light, the conversion is performed without electrical power supply.

Regarding the different wavelengths of the data modulated pumping lights, although Morales states that the wavelengths from the pumping lights are the same, technologically the wavelengths from two different transmitters cannot be exactly the same. Another prior art, Okano et al, teaches an optical transmission system in which each optical sender (Figure 1: 8 (#1 to #n)) outputs optical signal having arbitrary

wavelength, and then it is obvious that one wavelength converter (one of the wavelengths converters, 12 #1 to #n) can be configured to receive the data modulated pumping light at a wavelength different from other wavelengths of data modulated pumping light received at the other wavelength converters. By using the transmitter with arbitrary wavelengths, the requirements for the transmitter can be less stringent. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the transmitter with arbitrary wavelength in the optical network unit as taught by Okano et al to the system of Morales et al so that less stringent requirements can be applied to the transmitter, and the system cost can be further reduced.

Regarding the conversion performed without electrical power supply, however, Kim et al teaches a plurality of injection-locked sources (e.g., F-P SLD in Figures 1 and 5) configured to receive injection light from an injection source (the Broad-band ASE source in Figures 1 and 5) outside the passive kerb location. The injection locked sources (the F-P SLD in Figures 1 and 5) including a plurality of laser cavities (Fabry-Perot Laser cavity in Figures 1 and 5) configured to select a distinct resonance peak of an incident light (the injection light from the broad-band source and AWG determine the appropriate resonance peak of the F-P laser, Figure 2); and injection locking sources configured to form data modulated transmission light based on the injection light and the data pumping signal (Figure 1, 2 and 5); and passively converting the data signals from each optical network unit (the ONU in Figures 1) into data modulated transmission light (the signals sent from F-P SLD to the AWG).

But, Kim et al does not expressly state that the data signal used to pump the F-P SLD is an optical signal, or the F-P SLD is “optically pumped source”.

However, to use an optical data signal to pump an injection locking source is well known in the art. Stubkjaer teaches an optical wavelength converter (e.g., Figure 1a) in which a data signal $\lambda 1$ pumps the optically pumped source (Optical gate, the injection light is CW light $\lambda 2$). Stubkjaer discloses that the opto-electronic conversion is avoided (page 1428, left column).

Morales et al teaches that the wavelength converter or optically pumped source can be placed at the kerb location (e.g., AN in Figure 2). The combination of Kim at al and Stubkjaer teaches an optically pumped injection-locked light source without a supply of electricity, or passively converting the data modulated pumping light from each optical network unit into data modulated transmission light. And Kim et al and Stubkjaer teach a cost-effective and highly reliable and flexible optical WDM system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the injection locking light source as taught by Kim et al and Stubkjaer to the access node (or kerb location) of Morales et al and Okano et al so that a passive kerb location without a supply of electricity can be obtained and a cost-effective and highly reliable and flexible WDM network can be realized.

10). With regard to claim 54, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 53 above. And the combination of Morales et al and Okano et al and Kim et al and Stubkjaer further discloses wherein each optically pumped source includes a laser cavity (e.g., Kim:

Fabry-Perot Laser cavity in Figures 1 and 5) configured to select a distinct resonance peak of an incident light (the injection light from the broad-band source, and AWG and the laser cavity determine the appropriate resonance peak of the F-P laser, Figure 2).

4. Claims 16, 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al (US 5,706,111) in view of Kim et al (Kim et al: "A Low-Cost WDM Source with ASE Injected Fabry-Perot Semiconductor Laser", IEEE Photonics Technology Letters, Vol. 12, No. 8, August 2000, page 1067-1069) and Stubkjaer (Stubkjaer: "Semiconductor Optical Amplifier-Based All-Optical Gates for High-Speed Optical Processing", IEEE Journal on Selected Topics in Quantum Electronics, Vol. 6, No. 6, November/December 2000, pages 1428-1435).

1). With regard to claim 16, Morales et al discloses a method of optically transmitting data, the method comprising:

receiving data modulated pumping light from a plurality of optical network units (e.g., Figure 2, the access node AN receives data modulated pumping light, e.g., λ_a , or λ_d or λ_e from the ONTs) at a kerb location (the access node AN in Figure 2) in an optical data transmission system (e.g., Figures 2 and 3), wherein the kerb location comprises a wavelength division multiplexer (WDM) (Figure 2 or Figure O1 above, the wavelength division multiplexer WDM, which is located between the OABs and the optical fiber OF) and a plurality of optically pumped sources each assigned only to a single respective optical network unit (e.g., Figure 2, each individual OAB is assigned only to a single respective ONU: e.g., the OAB λ_a<->λ_1 is assigned to one ONT, and OAB λ_a<->λ_i is

assigned to another ONT, and OAB λ_a<->λ_n is assigned to another one ONT, column 5 line 14-24; and each OAB converts the data modulated pumping light, e.g., λ_a, from each individual optical network unit into data modulated transmission light, e.g., λ_i);

wherein each optical network unit is assigned a distinct predefined wavelength range for its data modulated transmission light corresponding to a distinct wavelength channel (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength channels are λ_1, λ_2 , ...λ_m , Figure 2 of Morales; the OAB converts the data modulated pump signal, e.g., λ_a, into data modulated transmission light corresponding to a distinct wavelength channel, e.g., λ_i); and wherein said converting is performed without an intermediate conversion to or from an electrical signal (Morales et al discloses that "the conversion to electrical signals takes place only in the network terminating equipment to which the subscriber terminals are connected", column 3, line 63-65; and "consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that occur in present networks", column 1, line 16-20; therefore, the data modulated pumping light is passively converted into the distinct wavelength channels, performed without any intermediate conversion to or from an electrical signal); and

routing the data modulated transmission light, using the WDM (Figure 2 or Figure O1 above, the WDM, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths, and route the multiplexed $\Sigma\lambda_i$ over one of the optical fibers to the CE or hub), via the wavelength channels (Figure 2, $\Sigma\lambda_i$) each having

distinct predefined wavelength ranges (Figure 2, λ_i) assigned to respective optical network units for transmission to a hub with a passive optical router (the optical router: the WDM located between the OABs and the optical fiber OF and the optical access board OAB: column 4, line 27, and column 5 line 22-23; the WDM multiplexes the m different wavelengths and transmits the multiplexed signals over one of the optical fibers to the CE or hub).

But, Morales et al does not expressly state that the kerb location is a passive kerb location; and receiving injection light from an injection source at the passive kerb location, wherein each optically pumped source includes a laser cavity configured to select a distinct resonance peak of an incident light, and wherein the optically pumped sources are configured to form data modulated transmission light based on the injection light and the data modulated pumping light; and passively converting the data modulated pumping light from each optical network unit into data modulated transmission light based on the injection light and the data modulated pumping light.

However, Kim et al teaches a plurality of injection-locked sources (e.g., F-P SLD in Figures 1 and 5) configured to receive injection light from an injection source (the Broad-band ASE source in Figures 1 and 5) outside the passive kerb location. The injection locked sources (the F-P SLD in Figures 1 and 5) including a plurality of laser cavities (Fabry-Perot Laser cavity in Figures 1 and 5) configured to select a distinct resonance peak of an incident light (the injection light from the broad-band source, and AWG and the laser cavity determine the appropriate resonance peak of the F-P laser, Figure 2); and injection locking sources configured to form data modulated transmission

light based on the injection light and the data pumping signal (Figure 1, 2 and 5); and passively converting the data signals from each optical network unit (the ONU in Figures 1) into data modulated transmission light (the signals sent from F-P SLD to the AWG) based on the injection light and the data signals.

But, Kim et al does not expressly state that the data signal used to pump the F-P SLD is an optical signal, or the F-P SLD is “optically pumped source”.

However, to use an optical data signal to pump an injection locking source is well known in the art. Stubkjaer teaches an optical wavelength converter (e.g., Figure 1a) in which a data signal $\lambda 1$ pumps the optically pumped source (Optical gate, the injection light is CW light $\lambda 2$). Stubkjaer discloses that the opto-electronic conversion is avoided (page 1428, left column).

Morales et al teaches that the wavelength converter or optically pumped source can be placed at the kerb location (e.g., AN in Figure 2). The combination of Kim at al and Stubkjaer teaches an optically pumped injection-locked light source without a supply of electricity. And Kim et al and Stubkjaer teach a cost-effective and highly reliable and flexible optical WDM system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the injection locking light source as taught by Kim et al and Stubkjaer to the access node (or kerb location) of Morales et al so that a passive kerb location without a supply of electricity can be obtained and a cost-effective and highly reliable and flexible WDM network can be realized.

2). With regard to claim 21, Morales et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 16 above. And the combination of Morales et al and Kim et al and Stubkjaer further discloses the method comprising optically pumping, at the passive kerb location, the plurality of optically pumped sources with the plurality of respective data modulated pumping light (Morales: the data signals as pump signal are optical signals with wavelength λ_a , or λ_d or λ_e, Figure 2 of Morales).

3). With regard to claim 23, Morales et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 16 above. And Morales et al further discloses wherein the data modulated pumping light signals are is within a wavelength range which does not include the wavelength or wavelengths of the wavelength channels (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength used to carry data traffic in upstream and downstream directions are λ_1, λ_2 , ... λ_m , Figure 2 of Morales).

5. Claims 11, 12, 20 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al and Okano et al and Kim et al and Stubkjaer as applied to claim 1 above, and in further view of Zah (US 6,434,175).

1). With regard to claim 11, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. But Morales and Okano et al and Kim et al and Stubkjaer do not expressly disclose wherein the optically pumped sources comprise external cavity lasers.

However, the external cavity laser is well known in the art. Zah teaches such a laser, a multiwavelength laser includes a multiplexer (inside the laser cavity) for providing wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each comprising an external laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the external cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified packaging and compactness, without complications, to support the DWDM applications. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the external cavity laser as taught by Zah to the system of Morales et al and Okano et al and Kim et al and Stubkjaer so that a compact, high wavelength accuracy and selectivity multiwavelength laser system can be obtained.

2). With regard to claim 12, Morales et al and Okano et al and Kim et al and Stubkjaer and Zah disclose all of the subject matter as applied to claims 1 and 11 above. And the combination of Morales and Okano et al and Kim et al and Stubkjaer and Zah further discloses wherein the optical router is within a laser cavity of at least one optically pumped source (Zah: the multiplexer PHASAR MUX/the wavelength router, is inside the laser cavity).

3). With regard to claim 20, Morales et al and Okano et al and Kim et al and Stubkjaer disclose all of the subject matter as applied to claim 1 above. But Morales and

Okano et al and Kim et al and Stubkjaer do not expressly disclose the optically pumped sources each comprising a laser cavity, mirrors defining the cavity, and wavelength selective elements inside the cavity.

However, a laser cavity with the wavelength selective element inside, such as the phasar laser, is well known and widely practice in the art. Zah teaches such a laser, a multiwavelength laser includes a multiplexer (PHASAR MUX inside the laser cavity) for providing wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each comprising a laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the cavity), and wavelength selective elements (the phasar multiplexer 320 inside the cavity).

Morales et al and Okano et al and Kim et al and Stubkjaer teach a cost-effective WDM PON system. Zah provides laser with a high wavelength accuracy and selectivity, simplified packaging and compactness, without complications, to support the DWDM applications. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the laser cavity as taught by Zah to the system of Morales et al and Okano et al and Kim et al and Stubkjaer so that a cost-effective, compact, high wavelength accuracy and selectivity multiwavelength laser system can be obtained.

4). With regard to claim 34, Morales et al and Okano et al and Kim et al and Stubkjaer and Zah disclose all of the subject matter as applied to claims 1 and 11 above. And Zah further disclose wherein the external cavity laser is formed from narrow band reflectors. (e.g., the DBR 936 in Figure 8; although Zah calls the DBR 936 a broad band mirror, the DBR 936 can be viewed as a narrow band reflectors with respect to the broad band ASE source. In applicant's disclosure, the “narrow band reflectors”, e.g., the reflector in Figure 8 or 1020 in Figure 10, have to pass all wavelengths $\lambda 1$ to λk, therefore, the reflector is not exactly “narrowband” reflector in conventional definition).

6. Claim 45, 46, 48 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al (US 5,706,111) in view of Okano et al (US 6,449,074).

1). With regard to claim 45, Morales et al discloses an optical data transmission system (e.g., Figures 2 and 3) comprising:

a hub (e.g., the switch center CE in Figure 2);

a kerb location (the access node AN in Figure 2) having an optical router (the multiplexer and the optical access board OAB in the AN: column 4, line 27, and column 5 line 22-23; refer Figure O1 above, the multiplexer, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths and routes the multiplexed $\Sigma\lambda_i$ over one of the optical fibers to the CE) and a plurality of optically pumped sources (e.g., the OAB in Figure 2; Morales et al discloses that “the conversion to electrical signals takes place <u>only</u> in the network terminating equipment to which the subscriber terminals are connected”, column 3, line 63-65; and “consideration is being

given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that occur in present networks", column 1, line 16-20; that is, a plurality of optically pumped sources are presented in the AN); and

a plurality of optical network units (e.g., the optical network terminals ONT in Figure 2) each corresponding to one of the plurality of optically pumped sources (e.g., OAB in Figure 2), wherein each optical network unit has a laser for producing data modulated pumping light for transmission to its respective optically pumped source (the laser in each ONT generates data modulated pumping light, e.g., λ_a , or λ_d or λ_e in Figure 2, to the OAB),

wherein each optically pumped source is configured to receive the data modulated pumping light from its respective optical network unit (Figure 2, the OAB receives the data modulated pumping light λa/λd/λe from its respective ONT unit) and to form data modulated transmission light at a predefined wavelength range (e.g., Figure 2, the wavelength λi) assigned to its respective optical network unit (Figure 2, column 5 line 18-22, the OABs performs the conversion of the fixed wavelength coming from <u>each subscriber</u> optical network terminating unit into another wavelength λi that is <u>different for each active unit</u>, into a set of m different wavelengths),

wherein the data modulated transmission light is based on the data modulated pumping light (column 5 line 17-21, the OAB converts the fixed wavelength, λa or λd or λe, into another wavelength λi, and the data that is originally carried on the data modulated pumping light λa/λd/λe is now carried on the data modulated transmission

light λi; that is, the data modulated transmission light λi is based on the data modulated pumping light $\lambda a/\lambda d/\lambda e$), and

wherein the optical router comprises a wavelength division multiplexer (WDM) configured to receive the data modulated transmission light from the plurality of optically pumped sources (e.g., Figure 2 or Figure O1 above, the wavelength division multiplexer (WDM), which is located between the OABs and the optical fiber OF, receives the data modulated transmission light λi from the plurality of optically pumped sources OABs; column 4 line 27-28 and column 5 line 17-32) and route the data modulated transmission light to the hub (Figure 2 or Figure O1 above, the multiplexer, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths and route the multiplexed signal $\Sigma\lambda_i$ over one of the optical fibers to the CE or hub).

Morales et al teaches the optically pumped source. But, Morales does not expressly disclose: wherein each optically pumped source is configured to receive the data modulated pumping light from its respective optical network unit at a first wavelength different from other wavelengths of the data modulated pumping light received at the other optically pumped sources.

Although Morales states that the wavelengths from the pumping lights are the same, technologically the wavelengths from two different transmitters cannot be exactly the same. Another prior art, Okano et al, teaches an optical transmission system in which each optical sender (Figure 1: 8 (#1 to #n)) outputs optical signal having <u>arbitrary</u> wavelength, and then it is obvious that each wavelength converter (one of the

wavelengths converters, 12 #1 to #n) can be configured to receive the data modulated pumping light at a wavelength different from other wavelengths of data modulated pumping light received at the other wavelength converters. By using the transmitter with arbitrary wavelengths, the requirements for the transmitter can be less stringent. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the transmitter with arbitrary wavelength in the optical network unit as taught by Okano et al to the system of Morales et al so that less stringent requirements can be applied to the transmitter, and the system cost can be further reduced.

2). With regard to claim 46, Morales et al and Okano et al disclose all of the subject matter as applied to claim 45 above. And Morales et al further discloses wherein each predefined wavelength range corresponds to a distinct wavelength channel (column 5 line 18-22, the wavelength λi that is different for each active unit, and each wavelength channel λi has a specific bandwidth; that is, each predefined wavelength range corresponds to a distinct wavelength channel).

3). With regard to claim 48, Morales et al and Okano et al disclose all of the subject matter as applied to claim 45 above. And Morales et al further discloses wherein the data modulated pumping light is within a wavelength range which does not include wavelengths of the wavelength channels (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength channels are λ_1, λ_2 , … λ_m , Figure 2 of Morales, and column 7 line 14-16, the λ_1, λ_2 , … λ_m are new wavelengths).

4). With regard to claim 51, Morales et al and Okano et al disclose all of the subject matter as applied to claim 45 above. And Morales et al further discloses wherein the data modulated pumping light is at a wavelength different from a wavelength of light used to carry data traffic upstream from the kerb location and downstream from the hub (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength used to carry data traffic in upstream and downstream directions are λ_1, λ_2 , … λ_m , Figure 2 of Morales, and column 7 line 14-16, the λ_1, λ_2 , … λ_m are new wavelengths).

7. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al and Okano et al as applied to claim 45 above, and in further view of Keating et al (Keating et al: “High temperature, optically pumpled, 1.55 mm VCSEL operating at 6 Gb/s”, 57th Annual Device Research Conference Digest, 28-30 June 1999, pages 196-197).

Morales et al disclose all of the subject matter as applied to claim 45 above. But Morales does not expressly disclose wherein the kerb location is a passive kerb location.

Morales et al teaches “the conversion to electrical signals takes place <u>only</u> in the network terminating equipment to which the subscriber terminals are connected”, (column 3, line 63-65) and “consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that

occur in present networks" (column 1, line 16-20); that is, a plurality of optically pumped sources are in the AN. Another prior art, Keating et al, teaches a fully optically pumped light source (e.g., VCSEL in Figure 1 and 2), without electrically pumping.

Keating et al teaches that the electrically pumped VCSEL has been limited by optical losses and device self heating; and the optically pumped VCSEL can tolerance higher temperature, and have higher output power, transmits higher data rate and longer distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optically pumped light source as taught by Keating et al to the system of Morales et al and Okano et al so that the kerb location is passive, and a passive optical network with high optical power, longer transmission distance and better tolerance to the environment change can be obtained.

8. Claims 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al and Okano et al as applied to claim 45 above, and in further view of Zah (US 6,434,175).

1). With regard to claim 49, Morales et al and Okano et al disclose all of the subject matter as applied to claim 45 above. But Morales and Okano et al do not expressly disclose wherein the optically pumped sources comprise external cavity lasers.

However, the external cavity laser is well known in the art. Zah teaches such a laser, a multiwavelength laser includes a multiplexer (inside the laser cavity) for providing wavelength accuracy and reflectors for forming laser cavity (Figure 1, column

2, line 5-10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each comprising an external laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the external cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified packaging and compactness, without complications, to support the DWDM applications. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the external cavity laser as taught by Zah to the system of Morales et al and Okano et al so that a compact, high wavelength accuracy and selectivity multiwavelength laser system can be obtained.

2). With regard to claim 50, Morales et al and Okano et al and Zah disclose all of the subject matter as applied to claims 45 and 49 above. And the combination of Morales and Okano et al and Zah further discloses wherein the optical router is within a laser cavity of at least one optically pumped source (Zah: the multiplexer PHASAR MUX/the wavelength router, is inside the laser cavity).

9. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al and Okano et al as applied to claim 45 above, and in further view of Kim et al (Kim et al: “A Low-Cost WDM Source with ASE Injected Fabry-Perot Semiconductor Laser”, IEEE Photonics Technology Letters, Vol. 12, No. 8, August 2000, page 1067-1069).

Morales et al and Okano et al disclose all of the subject matter as applied to claim 45 above. But Morales and Okano et al do not expressly disclose wherein the optical router comprises an arrayed wavelength grating.

However, to use an AWG as the optical router is commonly known in the art. Kim et al teaches to use an arrayed wavelength grating (AWG in Figure 1) to route the optical signals to/from the optical network units.

The AWG has lower loss, flatter passband etc. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the AWG as taught by Kim et al to the system of Morales et al and Okano et al so that a system with a lower loss and higher quality can be obtained.

10. Claims 53 and 55-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morales et al (US 5,706,111) in view of Okano et al (US 6,449,074) and Keating et al (Keating et al: “High temperature, optically pumped, 1.55 mm VCSEL operating at 6 Gb/s”, 57th Annual Device Research Conference Digest, 28-30 June 1999, pages 196-197).

1). With regard to claim 53, Morales et al discloses a method of optically transmitting data (e.g., Figures 2 and 3), the method comprising:

receiving data modulated pumping light from a plurality of optical network units at a kerb location in an optical data transmission system (e.g., Figure 2, the kerb location AN receives data modulated pumping light λ_a or λ_d or λ_e from a plurality of optical network units ONTs) wherein the kerb location comprises a wavelength division

multiplexer (WDM) (e.g., Figure 2 or Figure O1 above, the wavelength division multiplexer (WDM), which is located between the OABs and the optical fiber OF, receives the data modulated transmission light λi from the plurality of optically pumped sources OABs; column 4 line 27-28 and column 5 line 17-32) and a plurality of optically pumped sources (e.g., the OAB in Figure 2; Morales et al discloses that "the conversion to electrical signals takes place only in the network terminating equipment to which the subscriber terminals are connected", column 3, line 63-65; and "consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that occur in present networks", column 1, line 16-20; that is, a plurality of optically pumped sources are presented in the AN) each assigned to a respective optical network unit (Figure 2, each OAB is assigned to a respective optical network unit ONT), and wherein the optically pumped sources are configured to form data modulated transmission light based on the data modulated pumping light (column 5 line 17-21, the OAB converts the fixed wavelength, λa or λd or λe, into another wavelength λi, and the data that is originally carried on the data modulated pumping light λa/λd/λe is now carried on the data modulated transmission light λi; that is, the data modulated transmission light λi is formed based on the data modulated pumping light λa/λd/λe);

converting the data modulated pumping light from each optical network unit into data modulated transmission light (the OAB converts the data modulated pumping light λa or λd or λe from each ONT unit into data modulated transmission light λi),

wherein each optical network unit is assigned a distinct predefined wavelength range (e.g., Figure 2, the wavelength λi) for its data modulated transmission light corresponding to a distinct wavelength channel (column 5 line 18-22, the wavelength λi that is different for each active unit, and each wavelength channel λi has a specific bandwidth; that is, each predefined wavelength range corresponds to a distinct wavelength channel);

receiving the data modulated transmission light at the WDM from the plurality of optically pumped sources (e.g., Figure 2 or Figure O1 above, the wavelength division multiplexer (WDM), which is located between the OABs and the optical fiber OF, receives the data modulated transmission light λi from the plurality of optically pumped sources OABs; column 4 line 27-28 and column 5 line 17-32); and

routing, using the WDM, the data modulated transmission light for transmission to a hub based on the respective distinct wavelength channels (Figure 2 or Figure O1 above, the multiplexer, which is located between the OABs and the optical fiber OF, multiplexes the m different wavelengths and route the multiplexed signal $\Sigma\lambda_i$ over one of the optical fibers to the CE or hub).

Morales et al teaches the optically pumped source. But, Morales does not expressly disclose: wherein a first optically pumped source is configured to receive the data modulated pumping light at a wavelength different from other wavelengths of data modulated pumping light received at the other optically pumped sources; and <u>passively</u> converting the data modulated pumping light from each optical network unit into data

modulated transmission light, the conversion is performed without electrical power supply.

Regarding the different wavelengths of the data modulated pumping lights, although Morales states that the wavelengths from the pumping lights are the same, technologically the wavelengths from two different transmitters cannot be exactly the same. Another prior art, Okano et al, teaches an optical transmission system in which each optical sender (Figure 1: 8 (#1 to #n)) outputs optical signal having arbitrary wavelength, and then it is obvious that one wavelength converter (one of the wavelengths converters, 12 #1 to #n) can be configured to receive the data modulated pumping light at a wavelength different from other wavelengths of data modulated pumping light received at the other wavelength converters. By using the transmitter with arbitrary wavelengths, the requirements for the transmitter can be less stringent. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the transmitter with arbitrary wavelength in the optical network unit as taught by Okano et al to the system of Morales et al so that less stringent requirements can be applied to the transmitter, and the system cost can be further reduced.

Regarding the conversion performed without electrical power supply, however, Keating et al, in the same field of endeavor, teaches a fully optically pumped light source (e.g., VCSEL in Figure 1 and 2), without electrically pumping.

Keating et al teaches that the electrically pumped VCSEL has been limited by optical losses and device self heating; and the optically pumped VCSEL can tolerance

higher temperature, and have higher output power, transmits higher data rate and longer distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optically pumped light source as taught by Keating et al to the system of Morales et al and Okano et al so that the kerb location is passive, and a passive optical network with high optical power, longer transmission distance and better tolerance to the environment change can be obtained.

2). With regard to claim 55, Morales et al and Okano et al and Keating et al disclose all of the subject matter as applied to claim 53 above. And the combination of Morales et al and Okano et al and Keating et al further discloses wherein said passively converting the data modulated pumping light is performed without an intermediate conversion to or from an electrical signal (e.g., Morales et al: column 3, line 63-65; and "consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-electrical conversion stages that occur in present networks", column 1, line 16-20; or Keating: no O/E and E/O conversion).

3). With regard to claim 56, Morales et al and Okano et al and Keating et al disclose all of the subject matter as applied to claim 53 above. And the combination of Morales et al and Okano et al and Keating et al further discloses, at the passive kerb location, the plurality of optically pumped sources with respective data modulated pumping light (e.g., Morales et al: column 3, line 63-65; and "consideration is being given to the need for using completely optical networks in which both transmission and switching take place in the optical domain, thereby avoiding the successive opto-

electrical conversion stages that occur in present networks", column 1, line 16-20, the plurality of OABs are optically pumped with respective data modulated pumping light λa or λd or λe; or Keating: optically pumped VCSEL, the VCSEL is optically pumped with the 980 nm data modulated pumping light).

4). With regard to claim 57, Morales et al and Okano et al and Keating et al disclose all of the subject matter as applied to claim 53 above. And the combination of Morales et al and Okano et al and Keating et al further discloses wherein the data modulated pumping light is within a wavelength range that does not include wavelengths of the respective distinct wavelength channels (Morales: the wavelength of the data signal as pump signals is λ_a, or λ_d or λ_e, and the wavelength channels are λ_1, λ_2, … λ_m , Figure 2 of Morales, and column 7 line 14-16, the λ_1, λ_2 , … λ_m are new wavelengths; or Keating: the pumping light 980 nm, and wavelength channel 1550 nm).

5). With regard to claim 58, Morales et al and Okano et al and Keating et al disclose all of the subject matter as applied to claim 53 above. And the combination of Morales et al and Keating et al further discloses wherein the kerb location is a passive kerb location (the combination of Morales et al and Keating et al further discloses optically pumped source, no electrical power supply; that is, the kerb location is a passive kerb location).

6). With regard to claim 59, Morales et al and Okano et al and Keating et al disclose all of the subject matter as applied to claim 53 above. And the combination of Morales et al and Okano et al and Keating et al further discloses wherein the data modulated pumping light is at a wavelength different from a wavelength of light used to

carry data traffic upstream from the kerb location and downstream from the hub (the wavelength of the data signal as pump signals is λ_a , or λ_d or λ_e, and the wavelength used to carry data traffic in upstream and downstream directions are λ_1, λ_2 , ... λ_m , Figure 2 of Morales, and column 7 line 14-16, the λ_1, λ_2 , ... λ_m are new wavelengths).

Allowable Subject Matter

11. Claims 43 and 44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LI LIU whose telephone number is (571)270-1084. The examiner can normally be reached on Monday-Friday, 8:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Li Liu/
Primary Examiner, Art Unit 2613
July 10, 2010